

GSL XXIV
Cobalt/Nickel
Plating Seminar
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Cobalt/Nickel Plating

- Definition of Plating
- Types of Plating
 - Electroplating
 - Electroless Plating
 - Advantages of Electroless Plating
- Materials to be Plated
- Plating Supplies/Equipment
- Part Preparation
 - Surface Finishes
 - Holding Methods
 - Cleanliness
 - Waterbreak Test
- Plating Equipment Set-up
- Plating Process
- Results
- Q & A

Definition of Plating

- Plating is a surface covering in which a metal is deposited on a conductive surface. (from Wikipedia)
- Plating is process where a thin layer of metal, such as gold or silver, is deposited on or applied to a surface.
(from The Free Dictionary)

Types of Plating: Electroplating

- Electroplating is the process of coating the surface of a conducting material with a metal. During the process, the surface to be covered acts as a cathode in an electrolytic cell, and the cover metal acts as an anode.
- Electroplating is typically used to cover a less expensive metal with a more expensive metal, or to cover a corrosive metal with a less corrosive or noncorrosive metal.

Electroplating Set-up

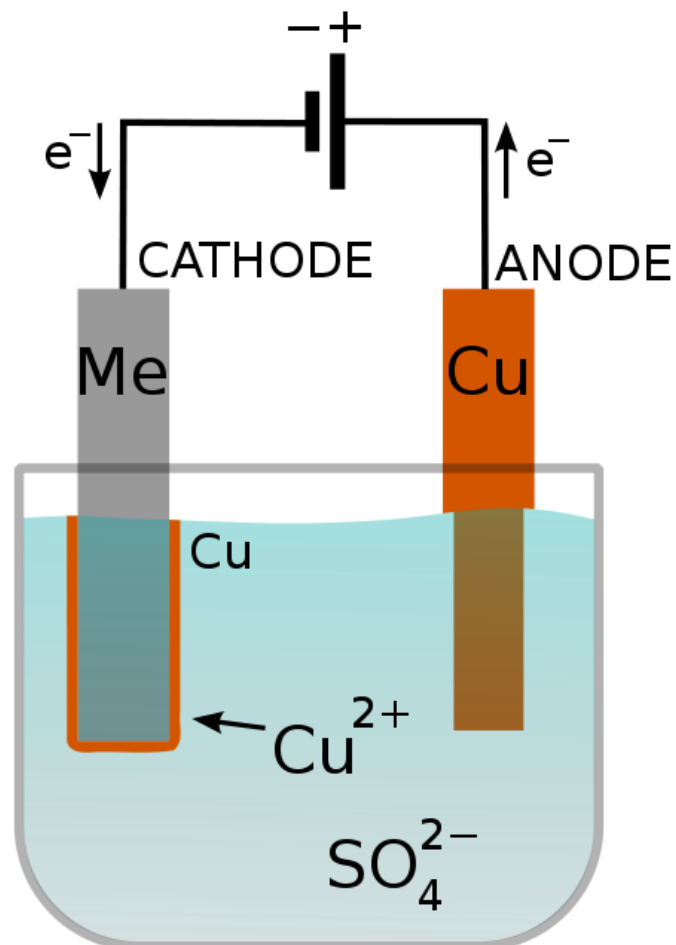


Illustration Courtesy of
The Free Dictionary

Types of Plating: Electroless Plating

- Electroless nickel plating is the plating of a nickel-phosphorous alloy deposit onto suitable substrates using a chemical reduction process.
- In comparison to electroplating, deposits are produced without an external electrical current. This avoids the problems associated with uneven deposit thickness or deposit uniformity due to current density issues.

Types of Plating: Electroless Plating

- Electroless plating is a non-galvanic plating method that involves several simultaneous reactions in an aqueous solution, which occur without the use of external electrical power.
- The reaction is accomplished when hydrogen is released by a reducing agent (typically sodium hypophosphite) and oxidized, thus producing a negative charge on the surface of the part.

Advantages of Electroless Plating

- Advantages of electroless nickel plating
 - Free from flux-density and power supply issues, it provides an even deposit regardless of workpiece geometry
 - Uniform deposit thicknesses are achieved on the inside of tubes, threads, blind holes, grooves and slots.
 - With the proper pre-plate catalyst, can be used to deposit material on non-conductive surfaces

Materials to be Plated

- Per the previous description, almost any material can be plated, provided it is, or can be made, electrically conductive.
- Common hobby materials to plate:
 - Iron/Steel
 - Brass/Copper/Bronze
 - Requires brief contact with iron while in the bath to start the reaction (more on this later)...
 - Lead-free solders
 - Aluminum, if the metal is primed with Zincate (zinc pre-treatment product) first.

Plating Supplies/Equipment

- For the hobbyist, the two main criteria are Cost and Hazardous Material (supply and waste) handling
- Caswell Inc. is the recommended source for the "casual plater" and for small-volume commercial plating
- Caswell offers a number of options relative to the type of plating needed, and the amount of plating required.
- Caswell offers various sizes of plating kits (from 5 pints to 5 gallons)to cover a range of plating needs.
- For most of their products, no special material handling or hazardous waste equipment is needed.



Caswell Plating Kit - Electroless Cobalt/Nickel



Caswell Electroplating Kit

May 3, 2013

GSL XXIV Seminar

12



Photo Courtesy of
Caswell Plating

Caswell Brush Plating Kit

Part Preparation: Surface Finishes

- Soldering
 - Lead-free solder is required, as lead will contaminate the bath and render it unusable
- Surface Finishes
 - The plating will not change the surface finish of the metal, so the part needs to be finished as desired prior to plating
 - Sanded surface
 - Abrasive blasted surface
 - Scotchbrite pad finish
 - Wire brushed surface
 - Polished surface
- Polishing Tools
 - Cotton polishing wheels
 - Polishing "station"

Part Preparation: Surface Finishes



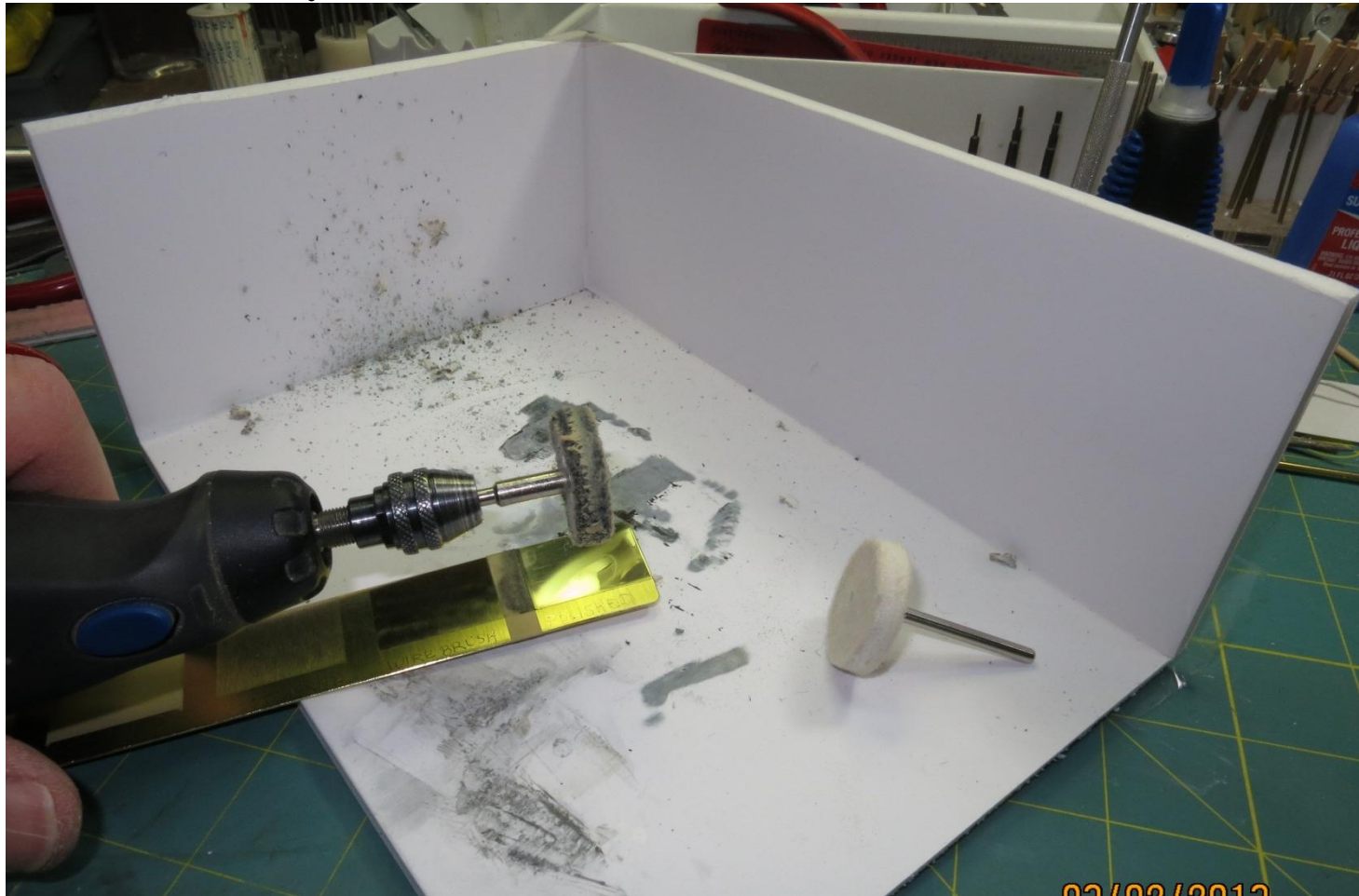
Polishing Tools

Part Preparation: Surface Finishes



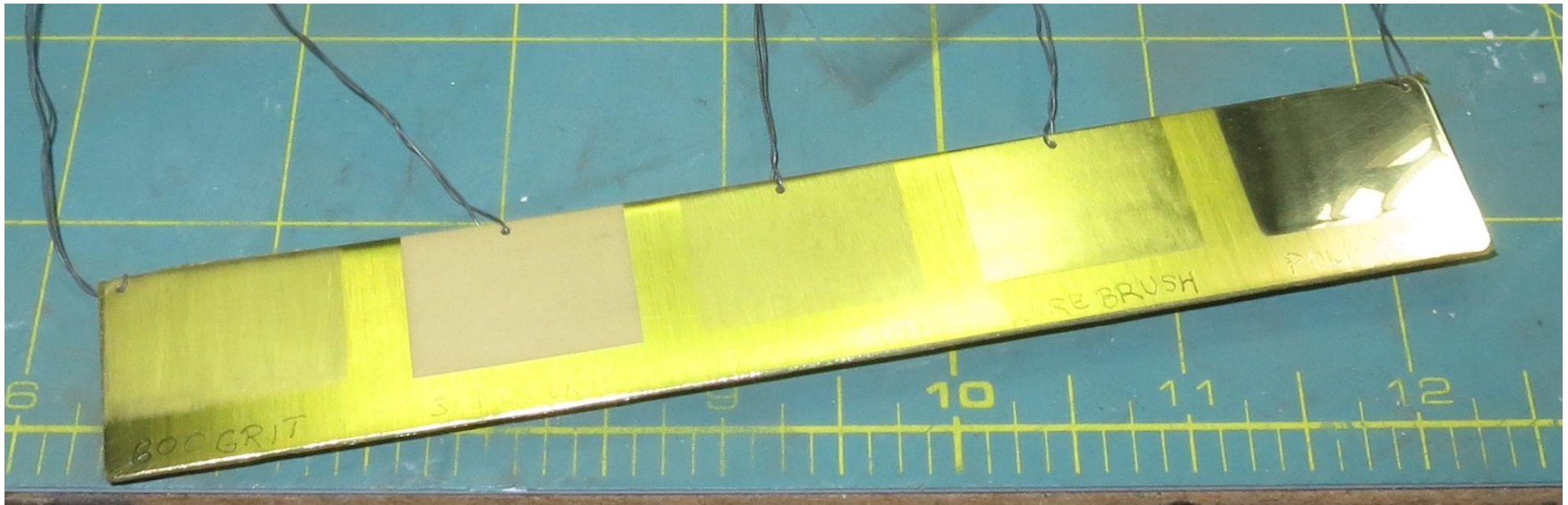
Polishing Tools

Part Preparation: Surface Finishes



Polishing Station

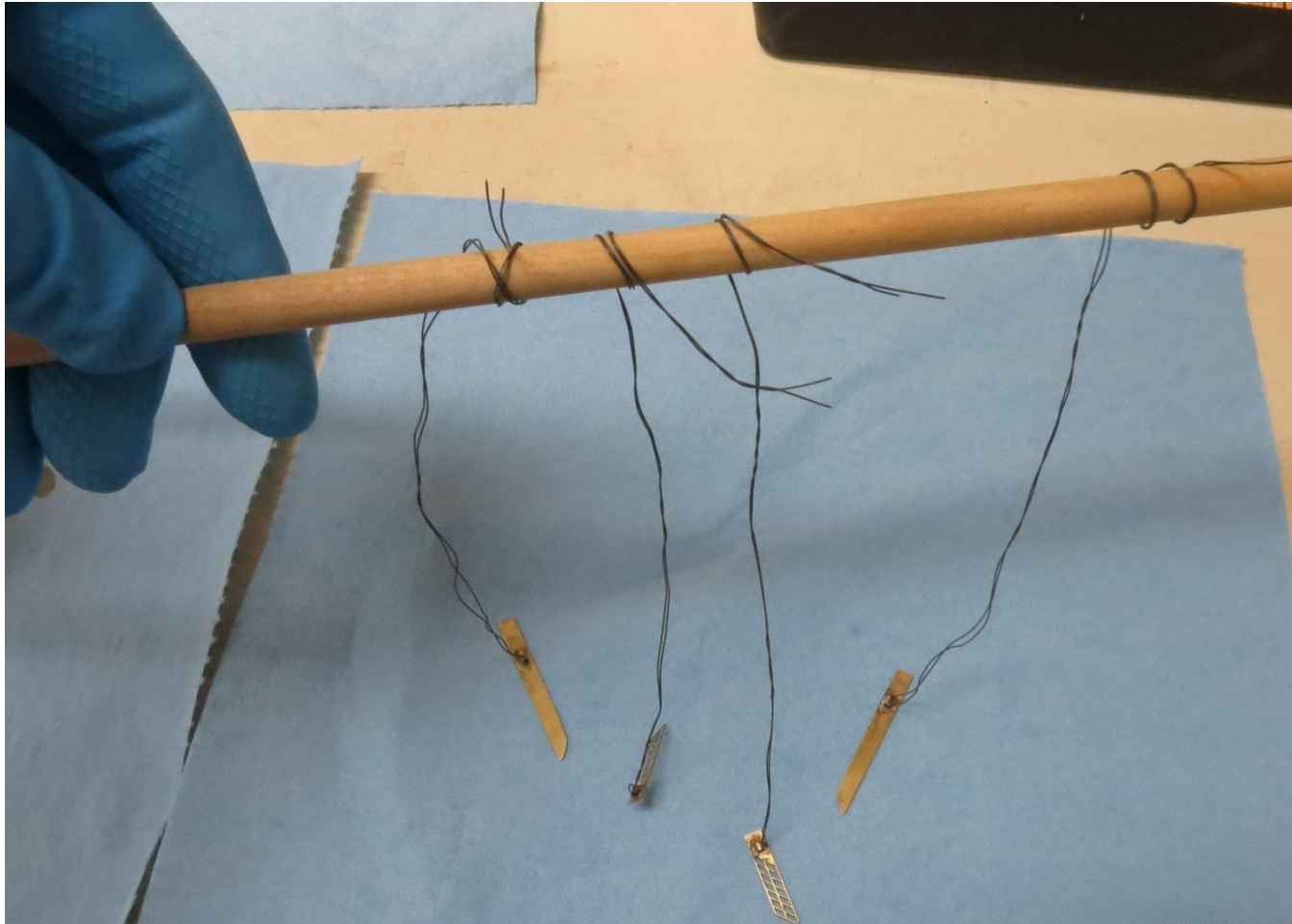
Part Preparation: Surface Finishes



800 grit sanded finish	Abrasive blast finish	Scotchbrite pad finish	Wire brush finish	Polished finish
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Surface Finish Comparison

Part Preparation: Holding Methods



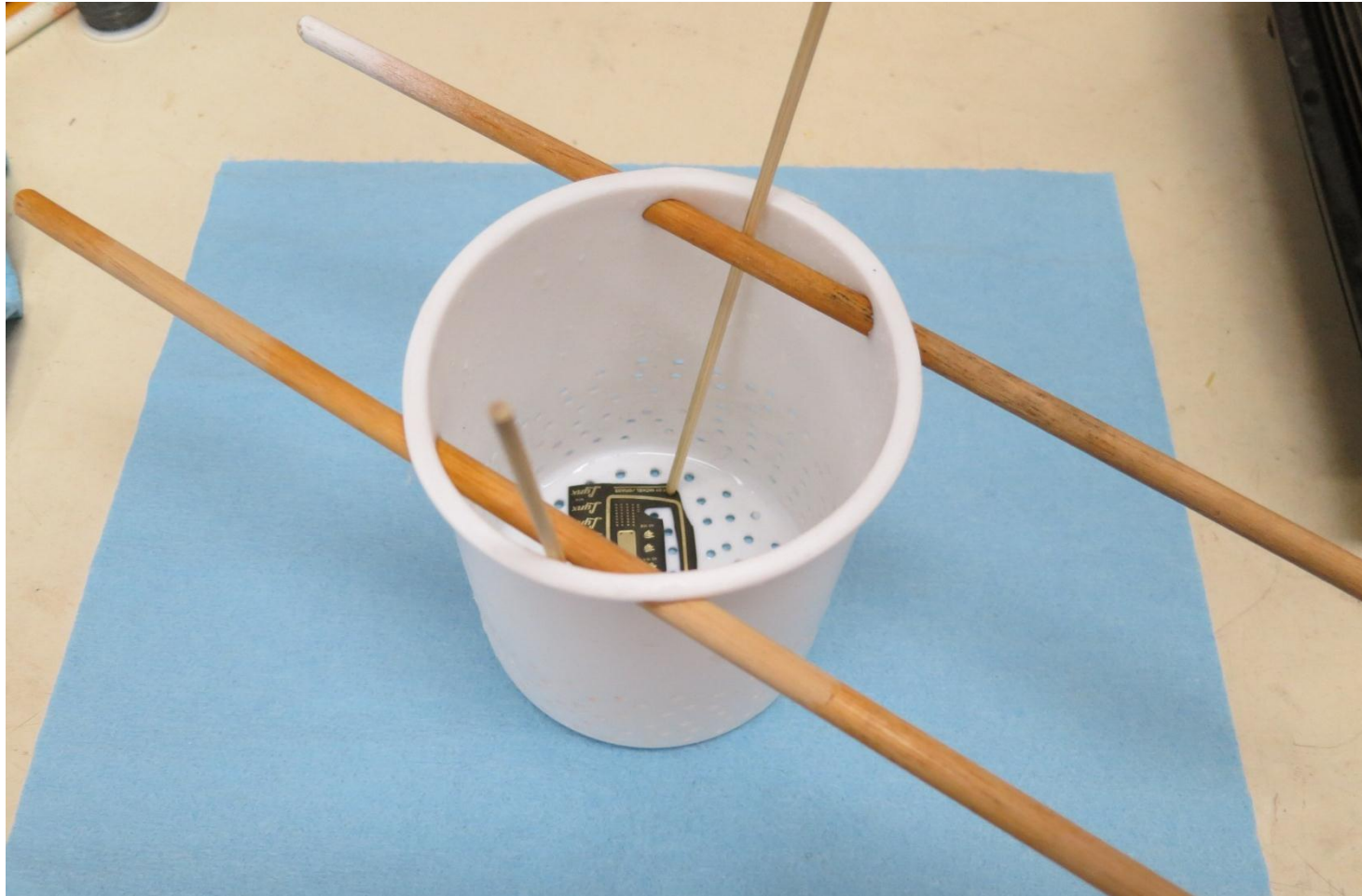
Wire hangers on wooden dowels

Part Preparation: Holding Methods



Wire hangers on wooden dowels

Part Preparation: Holding Methods



Plastic strainer basket for photoetch parts

Part Preparation: Cleanliness

- Cleanliness is the key to successful plating, since even molecular layers of oil can prevent adhesion of the plating.
- Cleaning processes include solvent cleaning, hot alkaline detergent cleaning, electrocleaning, and acid etc.
- Caswell recommends the use of the hot alkaline detergent cleaning method using TSP (tri-sodium phosphate).
- The use of distilled water is highly recommended.

Part Preparation: Cleanliness



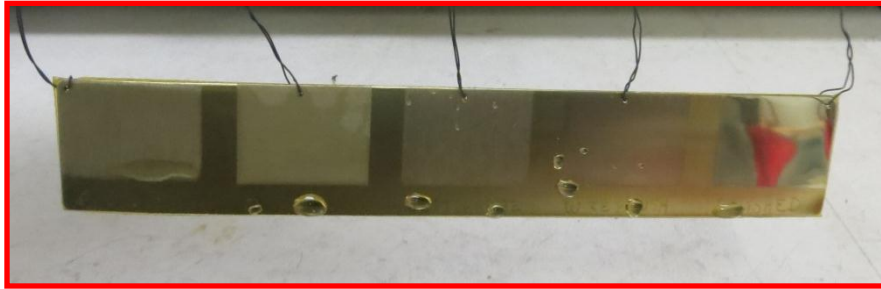
Part Degreasing Rinse

Part Preparation: Cleanliness

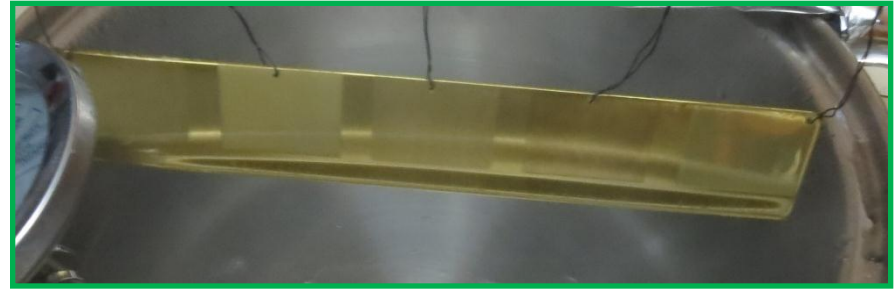
- Use a “waterbreak test” to verify the part is clean and ready to plate.
 - The surface is thoroughly rinsed and held vertical. Hydrophobic contaminants such as oils cause the water to bead and break up, allowing the water to drain rapidly.
 - Perfectly clean metal surfaces are hydrophilic and will retain an unbroken sheet of water that does not bead up or drain off.



Part Preparation: Waterbreak Test



Not acceptable



Acceptable



Waterbreak Testing

Plating Equipment Set-up



Electroless Cobalt/Nickel Plating

Plating Process



Plating underway (not much to see...)

Plating Process



PE parts on the rubber backing in the bath.

Plating Process



Starting the reaction with exposure to iron in the bath.

Results



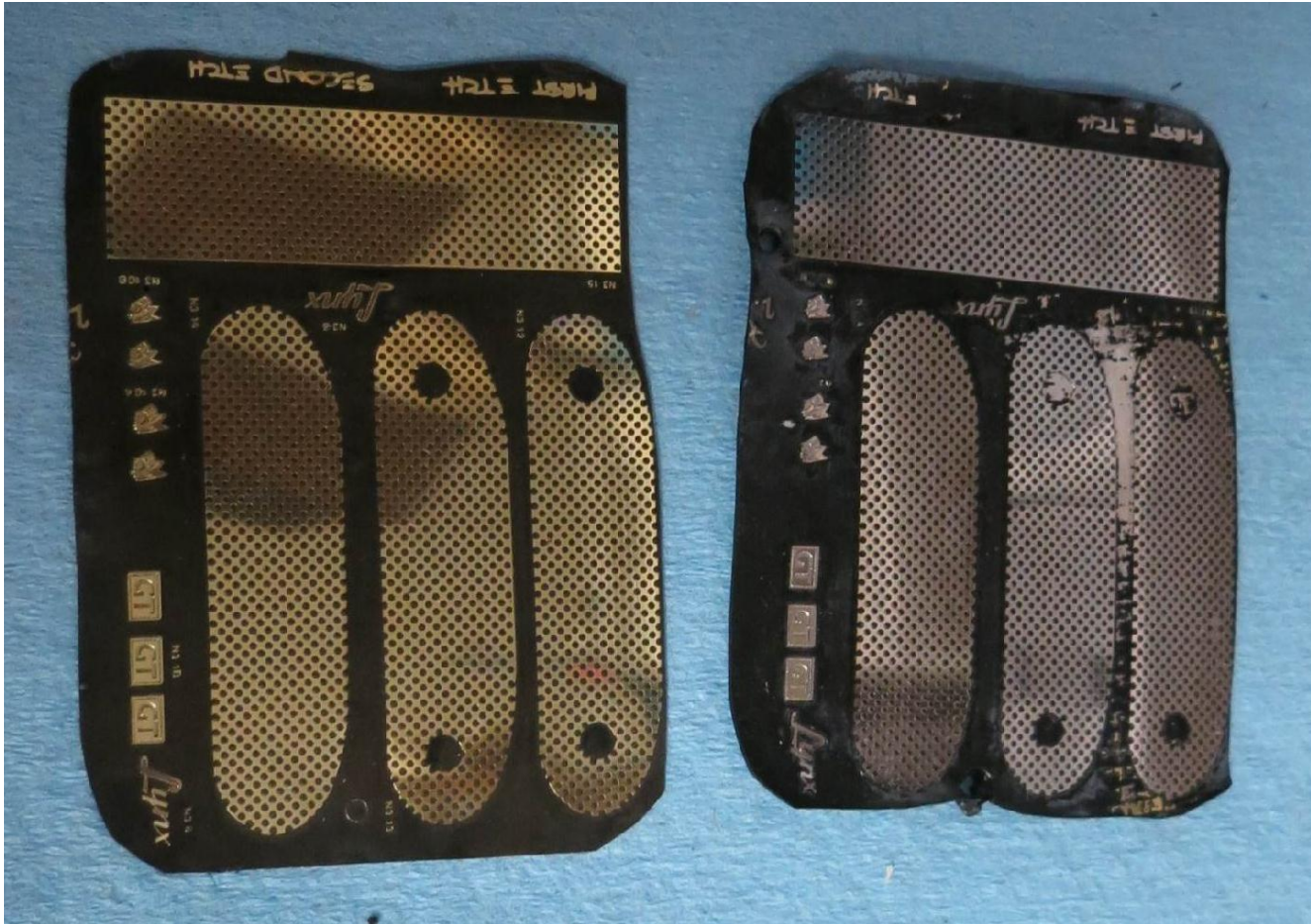
Brass roll bar, nerf bars, suspension links, and rear bumper

Results



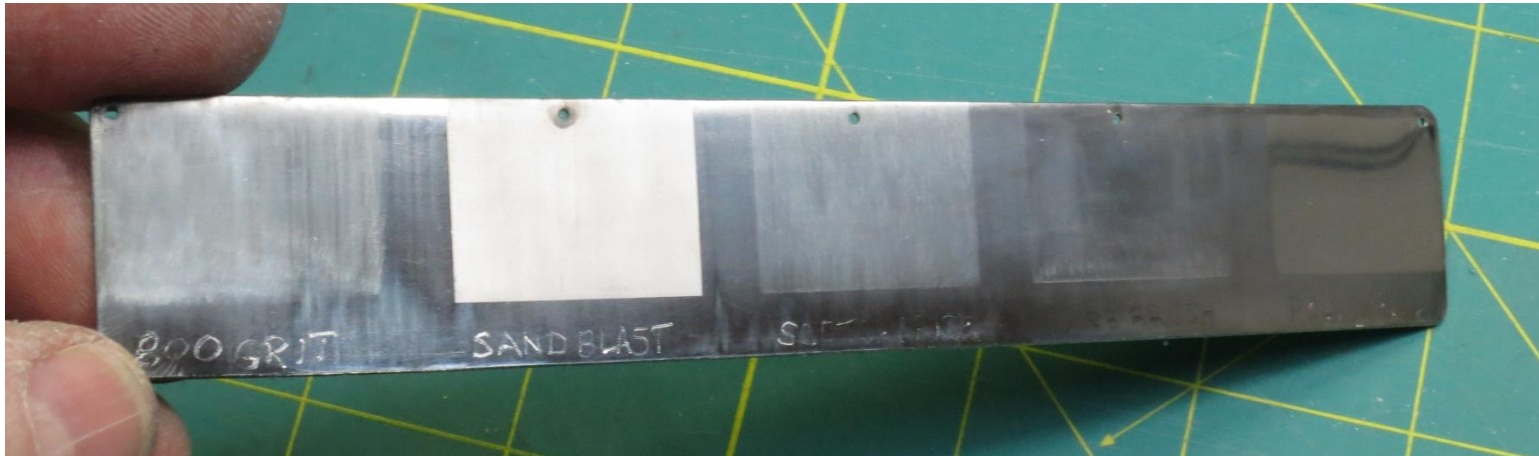
Close-up of rear bumper

Results



Before and after brass photoetch parts

Results



800 grit sanded finish	Abrasive blast finish	Scotchbrite pad finish	Wire brush finish	Polished finish
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Q & A

FAQ's